**Ulnar Neuropathy as a Complication of Macular Hole Surgery**

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**Objective:** To report a series of patients manifesting ulnar neuropathy as an extraocular complication following macular hole surgery and facedown positioning.

**Methods:** Retrospective chart review of 7 patients identified by the operating surgeon as developing ulnar neuropathy during the immediate postoperative period after undergoing vitrectomy surgery with fluid-gas exchange for macular hole followed by at least 1 week of strict facedown positioning.

**Results:** All 7 patients developed symptoms of ulnar neuropathy, including paresthesias, dysesthesias, pain, weakness, and muscle atrophy. Signs included abnormal electromyogram, prolonged nerve conduction velocities, and impaired neurologic clinical test results in patients examined. Symptoms did not resolve with cessation of facedown positioning, and with follow-up ranging from 3 to 24 months all patients had persistent symptoms. All patients had positioned themselves with their arms continuously flexed. Three of 7 patients had placed pressure directly on their bent elbows.

**Conclusions:** Ulnar neuropathy is an extraocular complication of macular hole surgery that can be attributed to arm position during postoperative facedown positioning. Surgeons performing macular hole surgery should caution their patients to minimize the amount of time spent with their elbows in a flexed position. Particular effort should be made to minimize pressure on the bent elbow.

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**REPORT OF CASES**

**CASE 1**

A 65-year-old man had a stage 3 macular hole in the right eye. Visual acuity was 20/200 OD. Vitrectomy surgery with removal of the posterior hyaloid and fluid-gas exchange was performed. Possibly due to poor compliance with postoperative facedown positioning, the macular hole failed to close and the lens developed significant posterior subcapsular cataract.

The patient was motivated to undergo repeated vitrectomy surgery with better postoperative facedown positioning. Three months later a second vitrectomy and fluid-gas exchange was performed in combination with phacoemulsification of the cataract and posterior chamber intraocular lens implantation. Because of a large body habitus, postoperative facedown positioning for this patient during the day was to lean forward, bent over a large pillow that was held close to the body with both hands. The arms were kept continuously in a flexed position, resting on his knees (*Figure 1*). At night he would lie on either side with his face tilted toward the pillow, arms straight down to his side. The patient reported strict compliance with facedown positioning during 90% of the 2-week postoperative period. The macular hole closed.

During the period of facedown positioning, the patient developed bilateral ulnar neuropathy. Symptoms included paresthesias, weakness, and muscle atrophy in the distal distribution of the ulnar nerve in both hands. The diagnosis was confirmed with an abnormal result on ulnar nerve con-
duction test (moderately severe conduction delay) and electromyography-proven ulnar nerve compression. The symptoms did not improve with cessation of facedown positioning. He required bilateral ulnar nerve transposition surgery, which was performed 6 and 7 months after the second macular hole surgery. Four months later, he had regained normal strength in both upper extremities, but paresthesias remained in the left hand.

CASE 2
A 64-year-old woman was diagnosed as having a stage 4 macular hole in the right eye. Visual acuity was 20/400 OD. She underwent vitrectomy surgery with membrane peeling and fluid-gas exchange with 15% perfluoropropane. She was given instructions for strict facedown positioning for 1 week postoperatively. This patient’s method of facedown positioning involved sitting up and leaning forward with her head bent. This necessitated resting her head on her hands and resting her elbows on her knees, or a variety of armrests, tables, chairs, etc (Figure 2). Thirteen days after vitrectomy surgery, the patient complained of numbness in both hands, specifically in the fourth and fifth digits. The macular hole was sealed.

Two weeks after macular hole surgery, the postoperative course was complicated by a rhegmatogenous retinal detachment, requiring repeated vitrectomy with lensectomy, scleral buckle, and fluid-gas exchange with 20% sulfur hexafluoride gas. Although symptoms of ulnar neuropathy were present, the patient was again instructed to maintain facedown positioning for 1 week.

Two months after macular hole surgery, the patient was evaluated by a neurosurgeon for complaints of persistent numbness and weakness in the fourth and fifth digits of both hands. On clinical examination, there were signs of bilateral ulnar nerve motor dysfunction. There was also altered sensation to pinprick testing in the left ulnar nerve. On objective testing, ulnar nerve motor conduction velocity across the elbow was reduced bilaterally. The amplitude of the evoked muscle action potential in the right ulnar nerve with stimulation proximal to the elbow was less than 50% of the potential obtained with stimulation of the wrist. On the left side, the amplitude of the evoked muscle action potential with stimulation proximal to the elbow was only 60% of that of more distal stimulation. The findings were consistent with sustained compression injury of both ulnar nerves. No surgical intervention was recommended.

More than 18 months after retinal surgery, the patient has not been able to perform daily manual activities without significant pain. An accomplished pianist and teacher, she has not been able to play the piano.

CASE 5
A 68-year-old woman was diagnosed as having a stage 4 macular hole in the left eye. Visual acuity was 20/60 OS. She underwent vitrectomy surgery with use of autolo-

Figure 1. Body position of the patient in case 1. The arms are in a flexed position with only minimal pressure on the bent elbows.

Figure 2. The body position of the patient in case 2. The arms are flexed with pressure on the bent elbows.
gous platelet growth factor and 16% perfluoropropane gas. Postoperatively, she was instructed to remain in a prone position 90% of the time for the first 2 weeks, and then 50% for the following 2 weeks. She actually remained in a prone position 90% of the time for 5 weeks. She positioned herself by lying on her stomach with her forearms flexed next to her body, such that her hands were even with her shoulders (Figure 3). A rolled towel beneath her chin helped to stabilize her head position. After 1½ weeks, she complained of bilateral fourth and fifth digit paresthesias. After 2½ weeks, she developed numbness. After a complete evaluation by a neurologist, bilateral ulnar neuropathy was diagnosed and surgery to the elbow was recommended. She obtained a second opinion from an orthopedic surgeon, who recommended surgery on the wrists. Eight months after macular hole surgery, she underwent surgery on her right wrist, with no improvement in symptoms. Physiotherapy after wrist surgery also offered no benefit. She elected not to have surgery on the left wrist. One year after macular hole surgery, the hole is closed, with 20/32+2 visual acuity.

**RESULTS**

The Table summarizes the 7 case reports. There were 4 women and 3 men. Patient age ranged from 64 to 75 years. Three patients had been positioned facedown for 1 week postoperatively, two patients for 2 weeks, and one patient each positioned for 4 and 5 weeks postoperatively. All patients had been positioned in a manner that allowed their arms to be continually flexed. Three of 7 patients had been positioned in such a way as to put compression directly on the elbows. Five patients had bilateral neuropathy. Only 2 patients underwent elbow or hand surgery for relief of ulnar neuropathy symptoms. Follow-up ranged from 3 to 24 months. All 7 patients had persistent symptoms, varying from minimal to disabling. The macular hole closed in 6 of 7 eyes.

**COMMENT**

Ulnar neuropathy complicating postvitrectomy positioning after various types of retinal surgery has been previously reported in 7 patients.9 Postoperative positioning is an important, if not critical, step to successful macular hole surgery.2,3 Most surgeons now recommend that the patient spend the first 1 to 2 postoperative weeks in a strict facedown position.3,9 In fact, 2 studies3,9 reported an increased surgical success rate with facedown positioning 90% of the time for 2 weeks. We predict that this particular extraocular complication will become increasingly more recognized by surgeons performing macular hole surgery.

Ulnar nerve lesions are likely to occur in the elbow region, as the nerve runs behind the elbow between the olecranon and the medial epicondyle of the humerus.10 Compression neuropathy affects superficial nerves at bony prominences. In the condylar groove, the ulnar nerve stretches with elbow flexion and is exposed to pressure or trauma. The ulnar nerve then descends into the cubital tunnel. Entrapment neuropathy affects nerves running through narrow canals. Flexion of the elbow narrows the cubital tunnel by tightening its roof and causing inward bulging of its floor. Thus, ulnar neuropathy following facedown positioning may result from a combination of repeated external compression and prolonged internal entrapment.

We have reported 7 cases of ulnar neuropathy following vitrectomy for macular hole, with particular emphasis on the duration and method of facedown positioning. Each patient was instructed to remain facedown for at least 1 postoperative week. By self-report, 6 of 7 patients were compliant with facedown positioning. The macular hole closed in 6 of 7 eyes, suggesting compliance was probably good. Symptoms of ulnar neuropathy arose within 2 weeks for all patients and occurred during the period of facedown positioning. Symptoms for all patients included numbness, dysesthesias, paresthesias, weakness, and soreness in the ulnar distribution of one or both arms. Each patient chose to be face-
down in the position comfortable for them. Although each position was slightly different, the associated arm positions were similar: arms bent at the elbow, with or without pressure on the elbows. Some patients chose to sit up, bending their head forward and resting their elbows with arms bent. This arm position placed the ulnar nerve at risk for a compression-type injury. Other patients chose to position themselves in such a manner that their arms were continuously flexed, but without pressure on the elbows. Although this arm position places little or no direct pressure on the bent elbow, it does place the ulnar nerve at risk for an entrapment-type injury.

The symptoms of ulnar neuropathy may be mild and transient, resolving within weeks. However, they may be more severe, requiring surgical intervention or lasting for years. In the first case report, the patient required bilateral ulnar nerve transposition, and did not get relief of all symptoms on one side. In the second case report, the patient experienced permanent motor disability and sensory change. In the third case report, the patient underwent wrist surgery, probably inappropriately, without relief of symptoms. Thus, ulnar neuropathy is not an inconsequential problem for patients after macular hole surgery.

Postvitrectomy ulnar neuropathy has been reported to occur in both men and women, aged 19 to 75 years, with 6 to 28 days of facedown positioning. Any patient undergoing vitrectomy surgery that requires postoperative facedown positioning is at risk for its development, and patients undergoing macular hole surgery who are advised to spend the first 1 to 2 postoperative weeks in a strict facedown position are particularly susceptible. We recommend that surgeons performing macular hole surgery caution patients to minimize the amount of time spent with their elbows in a flexed position, with particular mention to minimize pressure on the bent elbow. Surgeons should frequently question patients during the postoperative period about numbness or pain in the distribution of the ulnar nerve. If a patient begins to experience symptoms, detailed questioning about the exact method of prone positioning and changes in the position of the elbow may minimize damage. Elbow pads or intermittent straightening of the elbow may offer relief. In this way, the risk of this extraocular complication of macular hole surgery may be reduced.

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REFERENCES